MUSIC TECHNOLOGY IN THE CLASSROOM

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May 2004

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Music Technology in the Classroom

Introduction

The last twenty years have exhibited unprecedented growth of music technology in the fields of commercial music, professional recording studios, personal home studios, and music education in the public school music classroom. With the establishment of school district programs providing students with access to computer technology from state lottery monies, music classrooms are now receiving their own computers and music software. Music software in the marketplace provides challenges to teachers and their efforts to integrate technology to their classroom instruction. How music educators determine what software is needed, what is appropriate, effective, and within their music budget is still a daunting and questioning effort. This can be a deterrent to those band and choral educators, who are initially reticent about music technology from acquiring, learning, and using music technology in their classrooms. This project will address these issues, the changing roles of teachers, music technology's effect on learning, use in the classroom instruction, National Standards, and philosophical viewpoints.

Historical Background

In the history of music, technology has always been present in aiding the facilitation of composition and publishing. Composers have always used whatever technological means at hand to get their works performed and published. From paper products to ink pens, composers and copyists have brought forth music and music parts for orchestras and ensembles. While music printing has continually improved, the technology to create printed music facilitated the creation of a market niche of print music for consumers, which in turn created income for composers.

The effect of technology helped to evolve keyboards from harpsichords to pianos. The creation of player organ and player piano technology using vacuum and paper rolls to "capture" the music performances of Gershwin demonstrates the unique ability of technology in a wider application. Home entertainment using player pianos, public entertainment using circus player organs, and early wax cylinder recordings of Brahms and other piano virtuosos of the turn of the nineteenth century again demonstrate how technology evolves and is used in music and for musicians into the twentieth century.

The advancing technology of recording in the twentieth century has captured music and performances of great artists in concert halls and studios. In general music education classrooms, the record player used in the 1960's and 70's by the music educator to demonstrate songs to the class has been replaced by the CD boombox since the 1990's. The use of audiotapes supplanted records as well, being generally "considered an educational technology. Audiotapes were mainly used for dictation and listening skills as they aided in the practice of sight reading and tone production, identifying performance techniques as well as practice in recognizing between musical styles. While tapes are still occasionally used for this, the CD quickly replaced tapes in music education" (2004, ¶ 1).

Commercial and personal home studios have benefited from evolving technology namely from analog tape to hard disk digital recording. These technological advances today make it possible to have quality band and choral school recordings. The audio-visual aspect of videotaping has become the preferred means of recording choral and band concert performances. The audio-visual technology presently in these areas for the music educator is fairly easy to incorporate into the music classroom because the goals and objectives are easy to obtain and assess visually and audibly.

The history of technology in music includes early film, video and television. Early film was used in music education as a basic instructional tool. Examples are found in early instructional films for band. In the band classroom, "the use of silent films showing fingering, hand positions, and embouchure for the clarinet for students who watched the film were meant to identify these as correct or incorrect" (2004, ¶ 2).

However, Walt Disney's wonderful and creative use of film to give music a visual component was exemplified in the release of *Fantasia* (1940). Here is an example of "a more eccentric use of film in music education [entertainment] using an animated film to teach musical texture. The animation in this film visually matches the musical texture – polyphonic, homophonic, monophonic, mixed – of the music being played. This is a way to present musical textures in a different and more tangible way" (2004, ¶ 2).

Television, on the other hand, is a direct education medium for the music classroom. Such a proliferate technology, as evidenced in our homes and classrooms, television was used as an educational tool in the 1950's. "The possibilities of television were so desirable that they began to be used so quickly that no research was conducted to determine the value of it as a tool. It's initial purposes were, enrichment, supplemental instruction, more uniform teaching, and the ability to extend the 'classroom' to more students" (2004, ¶ 3).

Moreover, these purposes came to fruition for the general public in the form of the televised series *Young People's Concerts with the New York Philharmonic* presented by the conductor and composer Leonard Bernstein from 1958 to 1972. The ability of the technology of television to 'expand' the classroom as an educational tool was profoundly influential to music education and awareness.

"Bernstein taught millions of television viewers all over the world about such diverse topics as impressionism, sonata form, orchestration, and folk music. These programs showcase his abilities as a teacher and communicator" (Bartram, 2004, p. 19).

As stated earlier, video technology is fairly easy to incorporate into the music classroom because the goals and objectives are easy to obtain and assess. Moreover, in the last fifteen years, video as an educational tool has replaced film and television in most music classrooms. The available and affordable video camera, along with the proliferation of video production companies, helped to provide clients like music educators with educational projects for the classroom and products for the music educator marketplace. "These video products have been used in music education in the following ways:

- Presenting rehearsal techniques to music education students
- As a supplement to advanced music theory courses
- Visual demonstration of musical concepts
- Pitch discrimination
- Identifying embouchure problems
- Conducting techniques

While video has been determined a helpful tool in music education, it is still believed that the results are better if it is used as a supplement or is accompanied by discussion or text. For this reason videos are frequently accompanied by written materials. There are three main approaches to using video as an educational tool:

1) View independently (without additional materials)
2) View and test
3) Introduction of topic, viewing of video, and discussion

As with most technologies being used today, there has not been sufficient research conducted to confidently determine which method is most effective" (2004, ¶ 4). Self-evaluation by students in performance or rehearsal by video is an effective tool for correction and improvement.

Developing technology for digital video will eventually replace the videotape cassette, but only as a more efficient media. Common practice use of this technology in the classroom will be modified by its use in conjunction with computers. Computers are our present tools of instruction and creation in the music education classroom as a music technology. Computer technology is established in many aspects of our lives and is in our schools and classrooms.

The development of music software for use in music education classrooms is an out-growth of music software created for commercial music uses such as recording and electronic music instruments control called sequencing. The different veins of music software development such as digital audio recording, digital sequencing, digital video, CD, DVD production, music notation, and music publishing have converged to form comprehensive technological systems. This convergence put the older forms of film/video, tape recording, sound or music composition together controlled under one product: the computer.

"Hardly any of this would be possible without a very important development: MIDI. MIDI (Musical Instrument Digital Interface) is basically a set of computer rules of communication that allow various computer-related devices to communicate with one another. This was developed during the early 1980's by 13 companies who joined forces with the goal of [giving their products the ability] to be used interchangeably. The specifications were first published in 1983 and now almost every music education computer software program requires MIDI. MIDI allows devices such as synthesizers, sequencers, computers, signal processors, drum units and pitch-to-MIDI converters to communicate" (2004, ¶ 8).

Using this technology in educational settings resulted in the MIDI workstation consisting of keyboard, MIDI interface for connectivity, and hardware sequencer or computer. Music classrooms generally start out with a single station application which, depending on the vision, goals, and funding of the school district and school, can grow to the establishing of multiple stations in one room or space.

This historical background will culminate with an example from a high school in Georgia, "a school that even tech-savvy students consider years ahead of its time. First stop, the Music Lab. Thanks to Intel, the Music Department has a Musical Instrument Digital Interface (MIDI) lab that consists of 15 wireless laptops connected to MIDI – enabled keyboards that students can use to compose, transcribe, and arrange music. They can also use the devices for ear training, notation, and to explore music theory. The lab is fun and exciting for all music students, and is invaluable to those students seeking a career in music composition" (Raudonis, 2004, p. 6). Establishing a creative approach in music education using technology, has been the primary motivation in instruction shown throughout this historical survey.

Change in Instruction

According to Sam Hall, Deputy Superintendent of Information Technology in Houston County, Georgia, "Technology is changing the instructional model to meet the needs of students today. Without technology, we would essentially be using the same model that was in use in the 19th century" (Raudonis, 2004, p. 8). The changing roles between student and teacher parallels the "nineteenth-century European romanticism, with its virtuosity and eliteness, emphasized the technicalities of performance, as well as reinforced the separation of the composer from the performer and both from the listening public" (Beckstead, 2001, p. 45).

These changing roles, both composer and performer or teacher and student, serve as signs of the shift of emphasis in music composition and instruction as influenced by technology in music and in the music classroom.

To investigate how effective computer aided music instruction, composition, and musical assessment is in the classroom, first note the change in the role of student and teacher. In the conventional classroom situation where the student, being the passive recipient of instruction or of information as taught by the teacher, becomes the active thinker and choice-maker.

"Technology use allows students to be actively thinking about information, making choices, and executing skills than in typical teacher-led lessons. Moreover, when technology is used as a tool to support students in performing authentic tasks, the students are in a position of defining their goals, making decisions, and evaluating their progress" (2002, ¶ 1).

In the classroom, the path of music composition and instruction is directed by facilitation from the instructor by "setting project goals, providing guidelines and resources, moving from student to student or group to group, providing suggestions and support" (2002, ¶ 2). Project – based work such as composing music, creating a commercial, performing or researching, integrated with cooperative learning approaches illustrate the change in student and teacher roles.

For example, the music class is given the project of composing musical warm-up exercises for chorus or band to sing or play using the classroom computer notation software. The instructor would provide guidelines by stating specific tasks and how the interaction of the software will produce given results given the work by the students. After organizing the class into groups with each member given a specific responsibility to complete, the groups can then be monitored by the instructor moving from group to group as they work.

Questions can be answered by suggestions and while each group inputs their work to the notation program as support is given individually or in-group fashion. The result is that instruction blends into facilitation, which allows application by the students. "Uses of technology are highly compatible with this new teacher role, since they stimulate so much active mental work on the part of the students" (2002, ¶3).

Many music educators have not allowed a change in their classroom roles because they are uncomfortable with technology and the change of instructional strategies and methods that technology requires. However, "for the traditional music teacher, it is challenging to teach a class that includes students at so many different levels of musicianship. One method is to be less of a formal teacher and more of a coach" (Barbre, 2004, p 18). Not everyone is experiencing this shift of roles, though many are "struggling to incorporate technology into their teaching. Trying to learn the new technologies, many are having 'fits' feeling that the very foundation of their tried-and-true teaching methods are being torn out from under them as they work to learn the new skills" (Ponella, 2003, p. 16).

Certainly music educators have been ingenious with ways to present the curriculum of music through instructional strategies and styles. Music educators are used to trying new ways to teach music to their students. Moreover, having technology in a classroom that teaches music can be effective if misconceptions are faced squarely to eliminate this fearful feeling of 'cyberphobia'. Five misconceptions will be appropriate to the issues of music educator reticence, which "may lead to fear and an inability and unwillingness to learn technology for the classroom.

- **There is hidden "knowledge" inside the hardware that is intimidating.**

  This creates fear that one is at a disadvantage when, in reality, you, the teacher are the boss, with the hardware waiting for you to direct it to tasks and what programs to run.

The hardware cannot break if a button is pushed in error when used in a normal way.

- **Computer technology is reserved for the elite, takes too long to learn, and is only for the young.**

  This misconception deals with those that are more technologically knowledgeable. Newer computers and music devices are much easier to operate. Understanding concepts and procedures are part of the learning curve and at times, we must seek help from those whose technical knowledge is greater than ours. Many are happy to help and if you have achieved any success in music, it is likely that you have learned how to live with small but important gains from practicing. Approach computers and music technology the same way, and rich rewards will follow. As for computer technology being only for the young, this has to do with open-mindedness and a willingness to change with age and technology itself.

- **Using technology removes the creative spirit from music experience, producing music that is antiseptic or sterile.**

  Bad music is bad music! Bad music is the product of a lack of imagination or limitation of expressive manipulation. Creative thought does not evaporate by using technology in creative ways.

- **Technology takes time and money away from the real business of music education.** This has more to do with beliefs about what teaching strategies and the real business of music education should be. This would be in direct opposition to traditional methods of teaching music being more effectively facilitated by computers, MIDI, and CD-ROM used for teaching about music.

- **Technology, not music, becomes the focus.**

  This can be true when technology is used poorly and an inordinate amount of time is spent engaged in the frills of technology (Miyamoto, 2000, p. 13).

When faced with these misconceptions, most music educators will not face technology or its potential for creative instructional effectiveness. But given these responses, courageous music educators will extend the baton to include music technologies in their classrooms.

Effect on Learning

Applying music technology in the music classroom requires a different approach to the music student of elementary, secondary, and high schools levels. Increased student interest and achievement are the merits of integrating music technology into the curriculum, and while project-based learning can benefit children of all ages, a diversified and varied approach designed as age appropriate, works well for students in each level. Older students can learn software more deeply than younger ones, so elementary students are given a variety of approaches to learning programs on a surface level that is not as deep. "With younger students, you have to pay more attention to the *scaffolding* (the process of supporting the students until they are able to work independently) and guided practice of the simple basics than you do for older children, so that the younger students don't get off track. Scaffolding, in the form of coaching or modeling, supports students as they develop new skills and understand new concepts" (Spranza, 2004, p. 13).

Elementary students are *concrete sensory learners* as Jean Piaget's theory of cognitive development states. Music students at this level are building systems and working on the sound-symbol relationship with musical notes and phrases. Age appropriate music software programs like *Clef Notes, Ear Challenger,* and *Musical Stairs,* offer aural-visual music games of music

note identification and note series retention, further strengthening the sound-symbol relationship. There is a need to connect technology with the presence of traditional mechanical musical instruments and this need is greater in elementary students than with older ones.

"Elementary students need to connect the traditional instrument and voice to their experience with the computer. They need to understand that the computer playing back the music they have created represents the physical experience of making music" (Spranza, 2004, p. 13). Additionally, another teacher, Elizabeth Carr, a general music teacher at West Tisbury School, a K-8 school in Martha's Vineyard, Massachusetts, has observed the same learning connection. "Some kids from the third grade on never connected with singing, with music, until I offered music technology. Now those very kids are staying after school to work on projects in the keyboard lab" (Stinson & Altiere, 1997, p. 30).

Several effects on learning which technology brings about are increased motivation, self-esteem, improved study habits, reading skills, and math skills. Increased motivation is resident in "student satisfaction with the immediate feedback provided by the computer and the sense of accomplishment and power gained in working with technology:

The computer has been an empowering tool to the students. They have a voice and it's not in any way secondary to anybody else's voice. It's an equal voice. So that's incredibly positive. Motivation to use technology is very high. –Elementary school teacher

Self-esteem is derived from increased competence felt after mastering technology-based tasks and the awareness of the value placed upon technology within our culture" (2002, ¶ 5).

Any kind of project, lesson or task that requires the student to fulfill the goals of an assignment by using music technology, will allow the student to experience a competency that will lead to increased esteem. Technical skills that the student acquires through the use of a

broad range of software increases a basic understanding of how different computer tools operate. The music student will use these skills as tools to explore how music is constructed and heard using a variety of music software, and to support their learning of new software applications. These paths encourage more collaboration with peers working in cooperative groups as well as peer tutoring.

"In addition, the public display and greater legibility of student work creates an invitation to comment. Students often look over each other's shoulders, commenting on each other's work, offering assistance, and discussing what they are doing.

I've also seen kids helping each other a lot at the computer. The ones that pick it up faster, they love teaching it to someone that doesn't know it yet. –Fifth grade teacher

It's a much more facilitating atmosphere because the kids help each other so much on the computer. It changes the style and the tone of the classroom a lot. –Elementary school teacher (2004, ¶ 10).

As students use computers and educational programs with greater frequency, the music classroom should logically incorporate this technology into the music curriculum. With tools such as electronic keyboards and music software programs, "technology can enhance the learning process. Students, either individually or in groups, can use technology to develop skills and to increase their knowledge in the following way:

- By learning basic musical concepts

  Students benefit greatly from the exercise/drill features of many software programs. In this context, computers function as an extremely patient assistant" (Muro, 2002, ¶ 4).

Technology effects on learning are further enhanced at the middle school and high school levels. The use of technology in conjunction with the developmental stage these students are at increases learning possibilities not possible at the elementary level.

According to Piaget's learning theory, these students are becoming or have become what is called "formal operational thinkers, thinking about thinking. Possibilities become more important than reality. High school students can see more patterns and make more connections by thinking abstractly. They can construct a whole experience from the parts, and can keep several opposing ideas in their minds simultaneously" (Spranza, 2004, ¶ 13).

This is why music composition, in conjunction with music notation software programs, is so attractive to music students at this developmental level. Where earlier the instruction and depth of learning reached to the systems of sound-symbol relationships with notes and phrases, now music, either in performing or composing, takes on a deeper significance. "By arranging existing music or composing original music, students can experiment with the elements of music and create original musical compositions. By using notation software to print assignments, arrangements, and compositions, students can hear their music and print out notated versions of their work" (Muro, 2002, ¶ 4).

Music technology in the music classroom can only increase understanding of musical concepts, elements of music, and their interaction. It can facilitate learning in ways that re-enforce traditional concepts of how music is perceived, and encourage the development of musical thinking as well as experimentation in areas of teaching and curriculum that traditional methods fall short.

Use of Technology in the classroom

Having acknowledged music technology historically, the change in instruction, and the effects on learning, the use of technology in the classroom is an important area to explore. The broad range of music software and the tools to facilitate use in learning creates a broad range in the perspectives and strategies for use in the music classroom. The inevitable question is how?

To answer the question one must ask: what do you want to teach? This is the application of using new means and tools to carve out knowledge. More directly, help students carve out music knowledge and concepts that they can own and take to higher levels of learning.

"In education, music technology affords an opportunity for presentation of musical concepts in powerful ways. The new generation of music education software, which incorporates sound, images and animations can elegantly explain concepts like note value, where a quarter note can transform itself into two eighth notes on the computer screen using computer animation. It can also reinforce the concepts of rhythm and beat by linking the aural and visual cognitive process e.g. a visual bouncing ball which is synchronized to the beat of familiar music" (Henderson, 2004, ¶ 1).

The use for this software and these concepts are for Primary students. To teach the four basic music reading skills: recognition of line and space notes, learning the numbering system for the musical staff, notes moving up and down (visual and aural identification), and recognition of notes stepping or skipping up and down, choose an age appropriate software like *Early Music Skills* that contains these objectives. This kind of software is designed with a tutorial and drill exercise designed for the beginning music student or class. The teaching objectives must align with features and capabilities of the program. It must be designed for students who are in the preoperational stage of intelligence of Piaget's theory of cognitive development. Here they can

demonstrate through logical and systematic manipulation of symbols (notes, rests, clefs, and other musical symbols) by relating this to concrete objects (the learning objectives in the program). Other programs cover areas like aural memory, key signatures, note drills, intervals, and rhythm exercises, which, can offer different ways of presenting music curriculum areas that challenge and interest the music class and offer individual help to struggling music students.

The use of these programs can be either individual or class practice. If used in a one-computer classroom, the computer on a movable cart, or more favorably, a projection screen can be positioned for class viewing with a rotating "driver" at the keyboard. Individual practice can bring struggling students in line with motivated feelings of improvement and better class efforts. Use of software or hardware equipment like a MIDI sequencer in the music classroom is helpful at the Primary level where Orff and recorder activities need particular work and rehearsal which would be more helpful than a CD accompaniment that is inflexible. For example, "the main advantages of using the MIDI sequencer include the ability to:

- Provide accompaniments / ostinatos for recorder and Orff exercises
- Control the tempo
- Mute parts, such as the melody
- Isolate individual parts
- Raise or lower the key

When students are first learning to play a piece on an Orff instrument or the recorder, the sequence can be played back at a slower tempo, gradually increasing the speed as students gain proficiency. Another helpful aspect of a sequencer is its ability to control the separate parts.

If parts have been entered separately, the teacher can mute the melody part of the sequence while the students perform the melody on the recorder or play just the percussion part

for the class. Sequencers provide total control over every aspect of the playback as well as change the key of the accompaniment. A piece could be played on Orff instruments in the key of C and then performed in the key of G with recorders" (Rudolph, 2001, ¶ 10).

As one can see, innovative ways of using the sequencer in class offers flexibility providing warm-ups, performance accompaniments, isolating parts, displaying notation, composing and arranging, demonstration of orchestration and entire piece, to name only several uses in the classroom. The level of complexity for student use is dependent on age and depth of musical knowledge in their cognitive development. The use of sequences and composition at the elementary level generates enthusiastic responses from students.

"When I taught elementary music I had a unit on composition. One of the best ways to teach composition is to improvise. I would teach my students how to use the 'black notes' on the keyboard to play a pentatonic scale. I was amazed how well my students 'composed' music. We would listen to one another's composition and make constructive comments on them. Then we would talk about the elements that made a composition sound better. This was a great section for my students. I would also do a similar section on drum and percussion composition. The students would love when we did this unit. The piece of music technology that would help 90% of elementary music educators is the MIDI sequencer. You could use the MIDI sequencer every day in your classroom" (Midgley, 2000, ¶ 3).

For the middle school grades where formal operational thinking is developing, music software programs have more depth and require prior musical knowledge to some extent. Many of the fore mentioned uses of technology are applicable at this level with more depth and substance in the learning objectives. For example, software programs at this level introduce the

student to more music terminology for choirs, bands, and orchestras, more difficult ear training, sight reading, rhythm exercises and patterns, aural matching, and keyboard note skills.

At the middle school level, use of these software programs that are designed to reiterate and support previous musical skills and knowledge, move the music student and class to higher levels of literacy and skill. Classroom use of computer aided instruction can focus on individual needs. Some students may need extra work to understand and participate fully in musical activities. Individual work at a computer station on basic music concepts and terminology will help the student improve more efficiently than taking time to reinstruct in the classroom. Use software such as ECS's *Music Flash Cards*, which presents important music material in a drill and practice format with evaluation displayed at the end of each session. This presents a more manageable challenge to the middle school student in a fun, approachable concrete format.

Use of technology in the classroom at the middle school level offers these approaches to:

- "Teaching the technology: show the students the capabilities of the equipment. They will then find a 'need to know' and ask pertinent musical questions.
- Teaching scientific concepts: Teach the students about sound wave generation, timbre, and envelope. Look for opportunities for interdisciplinary concepts (related to math or science). For example, to teach an understanding of synthesis it is essential to teach some basic physics of sound.
- Teaching composition via sequencers: Let the students create music from a hands-on or 'sound before sign' approach" (Barnicle, 1994, p. 97).

The use of sequencers and notational programs to teach multiple components of the music curriculum is applicable to both middle and high school music programs. The sequence

and notational programs can be used in the classroom for playback of sequences, arranging music, composing original music.

Previously noted, was the use of sequenced accompaniments for Orff and recorder activities at the primary level. At the middle and high school levels, this application is desired as "an ever increasing number of educators want to use sequenced classroom, rehearsal, and performance accompaniments in their teaching. Since notational software allows for playback of music you've entered (in real time or stet time), you can use it sequence chorus and band selections, solo and small ensemble pieces. Using notation software for sequencing save time in having to learn a separate sequencing application. Major sequencing features are implemented in notation programs" (Watson, 2003, ¶ 4).

Arranging music in a broad sense, can be a lesson on timbre and texture by having students change the instrumental color as in selecting their own instruments and sounds on pre-existing music. Choral instructors can sequence the vocal parts to a difficult selection and learn and rehearse parts by muting vocal parts or increasing difficult to hear parts as the chorus gains an understanding of how vocal parts fit and contribute to the overall texture. For small ensemble rehearsal, where the players are not at the same level, the possibility of custom arrangements comes into addressing differentiated instruction. "Differentiated instruction – reaching and teaching your students simultaneously despite their various levels of proficiency – is a concept that can be realized with a custom trio arrangement with a challenging first part (trombone), a moderate second part (baritone), and a rudimentary third part (tuba). Special knowledge of your student's abilities will enhance the music created for them" (Watson, 2003, ¶ 21).

Middle school and high school music students gravitate towards creating their own music and notation/sequencer applications can allow opportunities for creativity and exploration.

The process of pencil and paper composition is difficult for students. However, "notation software makes it possible for students at any level to more easily record their musical inspirations and hear their pieces played with a variety of timbres. Students can experiment with sound and learn to associate sound with symbol. Students can print good-quality scores and extract parts for other musicians to perform" (Estrella, 2005, p. 17). This situation is exemplified with the Vermont MIDI Project (VMP). Simply stated, computers, MIDI instruments, notation and sequencing software are put into the hands of students for composition, guided by trained teachers. VMP is also an Internet mentoring program where students from grades 2 through 12 are learning to compose and arrange music.

It began with a handful of teachers and one composer, where now over 34 schools participate yearly. Different from, but similar to the Contemporary Music Project (CMP), VMP began in 1963 "to reshape school music programs to give greater emphasis to creative composition and contemporary music, to bring composers into contact with children, and to reduce the compartmentalization of the music profession into separate subdisciplines" (Campbell, 1995, p.57). Now composition returns to the music classroom via music technology.

Guide to Music Technology and the National Standards

The VMP program addresses National Standard 5: read and notate music, Standard 6: listen to, analyze, and describe music, Standard 7: evaluate music and music performance. In addressing National Standards 1-2: Singing a varied repertoire of music – alone and with others. Using notation/sequencer software can accomplish this by having students sing or play with accompaniments entered by students and generated by computer. Other software packages support and encourage those standards such as Make Music's *SmartMusicStudio* which

"plays an accompaniment while students sing or play an instrument into a microphone and adjusts to the tempo and phrasing of the student" (Richmond, 2004, ¶ 10).

Electronic Courseware Systems (ECS) offers *Cloud 9 Music, Keyboard Blues, MIDI Jazz Improvisation Series* addresses National Standard 3 improvising melodies, variations, and accompaniments. All three programs are based on student improvisation of melodic material, the capability to vary the melodic material for variations. PG Music *Band-in-a-Box* and MiBac *Jazz* are software that generates accompaniments to allow melodic improvisation practice. Arranging, composition, reading and notating music are represented in standards four and five.

"Several programs enable students to compose music. Some focus on composition using notes, while others use graphics to represent musical ideas. Still others use building blocks that represent sounds and can be arranged melodically and harmonically. Silver Burdett Ginn's Rock Rap n' Roll, part of the company's Making Music series, is another program that provides an excellent compositional activity. Students can learn about and experiment with different formal arrangements, layer melodies on top of accompaniments, improvise their own melodies, and record and save their compositions" (Richmond, 2004, ¶ 15).

National Standards 6 and 7 require students to listen to, analyze, describe, and evaluate music. The ECS *TimeSketch Editor PRO* is one software program that is ideal for these objectives. The program can take an audio CD or music file and creates a basic guided lesson graphic bubble chart for listening and analysis. Chart markers, synchronized text offsets appear as the audio track is played, introductory text (historical details, significant facts, etc.), explanatory captions, all work together in a visual graphic display. Most ear-training programs cover listening, analysis, and evaluations, in that they ask the student to quickly grasp, analyze, and return melodic and harmonic exercises to evaluate and develop listening skills.

Standards 8 and 9 ask for a relationship between music and other arts and disciplines and in relation to history and culture. The lessons of music history (ECS's *Music History Review*) and appreciation connect the arts and political events to music. The previously mentioned *TimeSketch Editor PRO* can be custom designed to incorporate historical, cultural, and artistic references in the graphic. Creative instructors can combine graphics and text in a three – staved time line connecting the historical, cultural, and artistic events and developments.

The most universal method for learning music within and between cultures is aural imitation. Learning music by imitation is natural, but learning music from an aural and visual model requires the singers listen and observe with repeated attention to detail. Connecting the relationship of musical approaches by world cultures is easily done by "Global Voices in Song's *Four Swazi Songs,* distributed by ECS, is an interactive CD that provides records of four songs from South Africa's Swazi people along with background information on the culture in which these songs arose. They plan to release at least three more such CDs covering folk songs of Hungary, Japanese traditional music, and the music of South Africa's Sotho people" (Richmond, 2004, ¶ 27). *Encyclopedia Encarta* is another resource for students to research other world cultures and hear an accompanying music file of their indigenous music.

Philosophical Viewpoints

"The way music was taught 20 years ago will not work with today's students. Technology is a part of nearly every discipline. It is not a fad and it is not going to go away" (Dawson, 1995, ¶ 1).

For a quote that is ten years old, the examination of music technology's history, how it can change instruction and its effectiveness on learning when used in the classroom,

resonates in this present age of technology growth. Today's music educator cannot avoid music technology when "our students now come to our music rooms with expectations of technology inclusions and curriculum, which is prevalent and growing in other subjects. These students now have a tremendous literacy and facility in technology and have a keen interest in the integration of such technology in their lives" (Swearingen, 2001, p.114).

The permeation of technology in society today is so pervasive that integration into commerce, communication, education, business, transportation, government, the arts and music, is undeniable. In music education, what role should music technology have in the music classroom today and in the future?

First, music technology should not negate traditional acoustical curriculum currently in practice. It should have a supportive role "that essentially 'attaches' technology to extend curriculum. Philosophically we are thinking about music fundamentals, theory, history, creatively and improvisation, research via the Internet on music and cross-curricular subjects, and writing. We have addressed and included the National Standards, and the basic skills in which each district wants our students to have competency and literacy in the subject of music" (Swearingen, 2001, p.114).

Second, music technology should and can provide an opening to all students wherever they are at in terms of knowledge, ability, skill, and interest. Engaging in a creative process such as "improvisation, performance, consumerism and audience development, research via the Internet, and writing" (Swearingen, 2001, p.115). Even if students are not skilled at singing or playing an instrument, music technology can engage them in music making that would lead to a greater participation in the traditional, acoustic practice of music making. Future student interest

and involvement in music as listeners as well as consumers will lead to community support of local music activity.

"Technology in music education needs a clearly defined philosophy by each music educator for effective teaching and appropriate usage with well-defined outcomes" (Swearingen, 2001, p. 115). This philosophy will focus music technology as a tool for instruction and learning.

Clear instructional objectives and defined goals will determine how music technology is used in the classroom for real instruction and not for meaningless fun and games. The tendency for the video culture to view computer aided instruction music software as 'gaming' will be negated if music technology is integrated and used with clearly defined objectives and goals.

However, these intentions may be points of contention with those educators who feel the use of music technology at the elementary level contributes to society's sedentary spectator slide towards an inactive means of expression. For example, Clinton Marshall, music coordinator of Baltimore County schools, "has purposefully kept music technology programs out of the elementary schools. 'Although we encourage teachers at the elementary level to use technology to enlarge their courses and deliver the richest resources to the kids, our philosophy is not to provide a sedentary type of expression. We see elementary general music much more varied, using Orff instruments in the limited time we have the children'" (Stinson & Altiere, 1997, ¶ 9).

Yet, in the music philosophy of Maureen Spranza, elementary music teacher at Lorenzo Manor Elementary School in Hayward, California, she feels that music technology should be an integral part of the music learning experience. Incorporating the preoperational stage of Piaget's theory of cognitive development, K-5 students are concrete sensory learners. "After age seven, the preoperational stage of intelligence is demonstrated through logical and systematic manipulation of symbols related to concrete objects. That is why, at the elementary level,

it is necessary to rigorously incorporate the use of technology with the whole experience of learning music" (Spranza, 2004, p.13).

Both of these music educators have valid points of philosophy backed by learning theory, and the undeniable tenet of children singing, moving, and playing via the Orff approach. To which side does the weight of the music philosophy for today's music educator gravitate?

When traditional methodologies are mutually exclusive to on-coming music technology, there is no helpful solution, nor does there exist a guiding music philosophy that would deter an impasse. Can the music educator define a music philosophy that incorporates traditional methodologies and technology to create an effective instructional and interesting learning experience in the music classroom?

The answer is yes, and with several considerations. Recognizing that music technology is a powerful tool for teaching and learning, the educator must integrate it into the curriculum and be open to redefining the ways of teaching and learning. Music technology can 'increase the student's depth of knowledge, ways of knowing, effectively help students learn in their own way, and discover the path to achievement. It must avoid becoming the focus of instruction, and keep quality teaching and learning foremost in teacher's minds" (Goddard, 2000, ¶ 10).

Another consideration is that the instructor must make music technology work for the basic concepts of the lesson within the curriculum. Many a music teacher has music software in their one-computer classroom and makes use of it minimally because of their unawareness of how it could serve to illuminate knowledge even in a specific instance or application. A brave willingness to familiarize themselves with the features and integrate it into the lesson is part of making the technology serve music classroom teaching and learning.

"Instructional technology has been heralded by many as a panacea by others for educational ills and a vital component, but critiqued as simply as 'add-on' or a 'subverter' of the traditional values of the core curriculum" (Goddard, 2000, ¶ 20). The music educator should avoid this quagmire and look forward to the technological tools and traditional methodologies at their disposal as an artist ready to paint on a blank canvas. What kind of picture do I want to paint? What colors best express what I see? What brushes will be the most effective?

The artist/music teacher has more than enough resources available to reach the minds of music students. As teaching music changes through the future years, so will the tools. Music educators will strive to balance the traditional methodologies and music technologies by exploiting the respective strengths and abilities of these two areas in the music classroom. This extra effort will serve the desired educational outcome and objective: student knowledge and success in the music classroom.

"For over a century, it has been too easy to follow a model of music education based on nineteenth century musical practice. What is needed today is forward thinking, risk taking, and experimentation with new teaching methods – in short, imaginative approaches to music education based on current realities" (Sebald, 2003, p. 66).

Music Technology in the Classroom

2-Day Lesson Plan # 1 for Grade 5

National Standard: (#1) Singing and (#2) Performing alone, or with others.

Objective: Students will sing ostinatos and two-part round with students performing expressively on recorders in two (staccato and legato) articulation styles along with sequenced accompaniment.

Materials:

- Computer with General MIDI sound card, powered speakers, or computer connected to General MIDI keyboard
- *Finale* or *Sibelius* notation software
- Optional hardware sequencer (Roland or Kawai)
- Teacher generated accompaniment file of the song "Kaeru No Uta" (Japan)
- Teacher prepared notation file of song notated in three staves with different colored notes for each voice entrance. Third color added for ostinato voice.
- Computer video projector

Prior Knowledge and Experience

Students have sung "Kaeru No Uta" in unison and have played the song melody on recorders. Recorder skills familiar with all notes up to required A.

Procedures

Day 1

- Project the score on the screen with only melody visible. Review melody by having class sing back in unison.
- Reveal second voice entrance and playback the two voices. Ask questions to direct class to an understanding of canon or round and what features define it.
- Divide class in half. Direct class in singing both parts independently, then in canon.
- Teach class the teacher-created ostinato by revealing the third part in the score.
- Divide class in three groups. Have each group sing their part. Direct class in singing the two-part canon with the ostinato leading off. Once mastered, and confident, switch parts around for familiarity of parts.
- Have each group sing with the sequenced accompaniment. Repeat until parts are blended and correct. Combine all parts with accompaniment.

Day 2

- Have class bring out recorders. Assign each group their parts, which are identical to the voice parts. Direct each group until parts are mastered and switched.
- Direct class in playing the two-part canon with the ostinato leading off. Once mastered and confident, switch parts around for familiarity of parts.

- Have each group play each part with their recorders with the sequenced accompaniment. Repeat until parts are correct. Combine each part until all parts are played together.
- Ask class the difference between staccato and legato, loud and soft until an understanding of the expression and articulation is achieved.
- Have each group play their parts with each type of articulation combination. Have class play the song through with each articulation and expression.
- Now, divide each group in half again. One half sings and the other half plays the recorder with pre-decided articulation and expression between the singers and players all together.
- Try different combinations and have class chose two different style combinations. For example: (1) voice parts legato with staccato recorder parts and voice ostinato staccato with recorder parts legato. (2) voice parts staccato with legato recorder parts and voice ostinato legato with recorder parts staccato.

Indicators of Success

Students can sing in a variety of combinations, two-part canon, ostinato, canon and ostinato. Students can perform on recorder that same canon, ostinato, canon and ostinato with different style of articulation and expression. Students can combine voices and recorders of same musical material different configurations.

Music Technology in the Classroom

Lesson Plan # 2 for Grades 4 & 5

National Standards: #5 Reading and notating music.

Objective:
Students will read and tap rhythms shown. Students will notate rhythmic patterns after hearing examples. Students will take paper rhythm test and also test individually on *Tap It* rhythm software. Rhythms are two, three, and four beats in length.

Materials:
- Classroom computer connected to powered speakers
- *Tap It!* rhythm music software
- Computer video projector and screen
- 10 notated rhythm examples on computer screen
- Teacher generated rhythm test on paper (5 rhythm choices and 5 dictated)
- Teacher designed rhythm test in software (10 rhythms)

Prior Knowledge and Experience
Students have knowledge of note values and rests and experience in clapping rhythms.
Students have knowledge and experience of note and rest notation.
Students have knowledge of Kodály rhythm syllables.

Procedures
- Open *Tap It!* software on computer set up for the class to view rhythm examples. Have students use Kodály rhythm syllables, tapping, and counting methods for each of the examples on the screen.
- Work through each example using the three methods. Then play the audio answer of the example. Go through all ten examples.
- Call upon individual students for assessment of class progress of comprehension.
- Have student helper pass out rhythm paper test while instructor opens the teacher generated rhythm test in *Tap It!* Student helper is instructed to take up test as well.
- Explain and administer the paper test with audio rhythm examples without visual answers. Explain the rhythm test in the software to be taken after paper test.
- Open the teacher designed rhythm test in the software, disconnect projection screen, and start the individual testing at the computer workstation as students finish.
- The student enters name and password for his or her file for record keeping.
- The student taps the rhythm examples in the software test using the space bar.
- This can be done the following day as the computer test takes 3-5 minutes.

Indicators of Success
Students can read and notate correct rhythms of 2, 3, and 4 beats in length.
Students can hear and write correct rhythms of 2, 3, and 4 beats in length.

Music Technology in the Classroom

Lesson Plan # 3 for grade 6

National Standard: Listening to, analyzing, and describing music

Objective:
Students will match pitch and analyze whether their intonation is flat or sharp.
Students will sing tonal patterns with correct pitch and intonation.
Students will gain understanding of pitch matching and intonation.

Materials:
- Computer with General MIDI card and powered speakers
- *Audio Mirror* music software (ECS)
- Shure SM-58 microphone to connect to computer
- Microphone stand
- Computer video projector
- Teacher generated tonal patterns survey file (20 patterns)
- Movable, standing partition for singer to sing behind, hidden from class

Prior Knowledge and Experience:
Students can sing patterns by echo or aural memory.
Students can sing in tune or match pitch, others cannot.

Procedures:
- Prior to class, set-up screen and projector so whole class can see. Set up microphone so singer can see screen. Load tonal patterns survey file.
- Explain how survey is given for correct matching and intonation. Demonstrate how pitches are matched and how a pitch can be flat or sharp by using the software. Demonstrate how to sing into the microphone and use a student as a model.
- Have class count off and number selves. Have all even numbers participate first according to rows. Have each student compose his or her own password.
- Have an even numbered student approach the computer set-up and microphone. Have student stand behind partition to sing. Start the survey by typing in the student's name and password, beginning the survey.
- As students are taking the survey, ask questions of the class that would lend support to students who would feel embarrassed or uncomfortable.
- Have the student listen to the pitch and sing near the microphone. Each student gets four pitches to match. Next, start the tonal patterns and have the student sing back the tonal patterns. Each student gets two patterns.
- Record the intonation for each student and number of correct pitches in the tonal patterns in the student file in the software.
- Call odd numbered students and repeat procedure until through.
- Have class discussion on singing out of tune, flat or sharp, and aural memory.

Indicators of Success
Student could tell whether their pitches were matched either by listening or by visual feedback from the projection screen. Students analyzed their own and others intonation and matching. Students could realize whether they needed more individual help or not.

Teacher's note: This technology lesson helps to identify those that have problems singing in tune with others. At the beginning of chorus, it is helpful to "survey" the class for tonally challenged students and offer individual help via the "*Audio Mirror*" and one-on-one coaching. Putting all the students through the survey negates the methods teachers use to "isolate" the out-of-tuners!

Music Technology in the Classroom

Lesson Plan # 4 for Middle School Grade 7

National Standards:
#4 Composing and arranging music within specified guidelines
#5 Reading and notating music
#6 Listening to, analyzing, and describing music
#7 Evaluating music and music performances

Objective:
Students will compose and notate 2 bar vocal warm-ups by listening to, analyzing, and describing. Students will sing other student composed warm-ups and will analyze and evaluate the vocal warm-ups.

Materials:
- Computer with connected powered speakers
- *Sibelius* or *Finale* music notation software
- Computer projection screen
- Music paper

Prior Knowledge and Experience:
Students have solfege knowledge. Students have notation knowledge and experience.

Procedures:
- Explain the basic premise of assignment and objectives to students.
- Divide class into groups of 3-4 students. Each member has certain responsibilities.
  1) Student suggests solfege choices
  2) Student sings suggestions, others listen, analyze, and evaluate
  3) Student does notation on paper
  4) Student does notation on notation software at computer
- Student groups work with teacher as facilitator and coach
- Groups enter work on computer notation and save file for later display.
- When all group work is entered and saved, activate computer projection screen.
- Have each group sing and repeat vocal warm-up. Have group describe warm-up.
- Ask questions for evaluation on vocal warm-ups. Have students refine warm-ups in their notation software files.
- Have class sing all the warm-ups and chose one for inclusion each day.

Indicators of Success
Students can compose satisfactory and appropriate vocal warm-ups. Students can listen, analyze, and evaluate music work to improve and refine warm-ups. Students can use notation software to enter and print out warm-ups for music notebooks.

Music Technology in the Classroom

Lesson Plan # 5 for High School Grade 10-12

National Standards:
#6 Listening to, analyzing, and describing music
#8 Understanding relationships between music, other arts & disciplines outsides the arts
#9 Understanding music in relation to history and culture

Objective:
Students will listen to selected music MP3s and choose selection to create an analysis file. Students will add relevant information and history as text and pictures from Internet to analysis file. Student will prepare file in music software *TimeSketch Editor PRO* for class presentation and will publish file for exchange with other students over the Internet.

Materials:
- Computer Lab with soundcard connected to headphones
- Music software *TimeSketch Editor PRO* (ECS)
- Loaded CD audio files for students to choose from on website
- Internet access
- Computer in class with powered speakers and projection screen

Prior Knowledge and Experience
Students can use Internet. Students have participated in previous analysis file creation in class. Students are familiar with computer lab and with research and importing files.

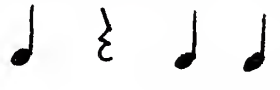
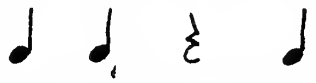
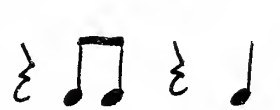
Procedures
- Students in the school computer lab will use music software *TimeSketch Editor PRO* and the Internet to choose music selection and download MP3 to create their (TimeSketch) file.
- Students will then research and provide significant facts in an historical overview, performance history, and timeline as text for introduction in file.
- Students will create a minimum of 5 links (HOTWORDS) to relevant sites in text.
- Students will create and use text to display specific offsets as music is being played, for description of different parts of the music, to point out significant events as they are heard.
- Students will use 'chart marks' to mark points in chosen musical piece and will create bubble chart graphic to aid in analyzing form.
- Students will send their file back to teacher's website at school for class evaluation and presentation.
- Students will publish their file (TimeSketch) to send over the Internet for others to view.

Indicators of Success
See attached Rubric.

Tap It! Rhythm Test

Name: _____ Score: _____

Circle the rhythm you hear 1-5.
Write the rhythm you hear 6-10.

			In this column… **Write the Kodály rhythm syllables.**	
1			1	
2			2	
3			3	
4			4	
5			5	
6			6	
7			7	
8			8	
9			9	
10			10	

Rubric for *TimeSketch* Student Files

Requirement	The required and more 10 Pts.	Just the minimum 5-9 Pts.	Not even 1-5 Pts.
Did you create a file and download MP3 file of your choice?	Yes		No
Did you provide an historical and cultural overview?	10 sentences or more	5 sentences	3 sentences or less
Did you research the performance history?	Provided 3-4 notable examples plus commentary	Provided at least 2 notable examples	Did not provide any
Did you include a timeline covering the events of the era in other arts and disciplines outside the arts?	Included timeline with at least ten events covering other arts and outside disciplines	Included timeline with a minimum of 5 events with limited coverage of other arts and outside disciplines	Did include a time line but little or none events and other coverage
Did you include links? (HOTWORDS)	Included 5 plus	Included 5 or less	Included only two or less
Did you include at least 10 offsets in your file?	Included 10 or more	Included just 5-10	Included 1-5 offsets or none at all
Did you establish "Chart marks" in the music piece?	Established 5 or more	Established 5 or less	Established 3 or less or none at all
Did you save and send your file to the Teacher's file on the school's website?	Yes		No
Did you publish and send to the rest of the class?	Yes		No
Did you present your *TimeSketch* to class?	Yes		No

Product Contacts

Alfred Publishing (818) 891-5999; http://www.alfred.com/

Ars Nova Software (800) 445-4866 or (425) 889-0927; e-mail info@ars-nova.com;

Classical MIDI Archives http://www.classicalarchives.com/

Clearvue/eav (800) 253-2788 or (773) 775-9433; e-mail CustServ@clearvue.com;
http://www.clearvue.com/

Edmark/Riverdeep (888) 242-6747 or (415) 763-4700; e-mail info@riverdeep.net;
www.riverdeep.net/products/thinkin_things

Electronic Courseware Systems (ECS) (800) 832-4965;
e-mail sales@ecsmedia.com; http://www.ecsmedia.com/

eMedia (206) 329-5657; e-mail custserv@emediamusic.com;
http://www.emediamusic.com/

Global Voices in Song http://www.globalvoicesinsong.com/

Hal Leonard Corporation (800) 637-2852 or (414) 774-3630;
http://www.halleonard.com/

Harmonic Vision, Inc. (800) 474-0903 or (312) 332-9200;
e-mail sales@harmonicvision.com; http://www.harmonicvision.com/

MacGamut Music Software International (800) 305-8731;
e-mail office@macgamut.com; http://www.macgamut.com/

MakeMusic, Inc. (SmartMusic) (888) 874-2144;
e-mail customerservice@smartmusic.com; http://www.makemusic.com

MENC Performance Standards
www.menc.org/publication/books/performance_standard/contents.html

McCormick's Enterprises (800) 323-5201 or (847) 398-8680;
e-mail sales@mccormicksnet.com; http://www.mccormicksnet.com

MiBac Music Software/Thinkware (distributor) (800) 369-6191 or (360) 594-4275
e-mail info@mibac.com; http://www.mibac.com/

Silver Burdette Ginn/Pearson at School
http://pearsonatschool.com/catalog/product.asp?product_id={1D6988A9-4AC1-40A6-82E5-F8C70BD978DE}

PG Music (250) 475-2874; e-mail info@pgmusic.com;
http://www.pgmusic.com

Sibelius Software, Ltd. (925) 280_0600; e-mail infoUSA@sibelius.com;
http:// www.sibelius.com/

TI:ME (Technology Institute for Music Educators) (610) 519-7215;
e-mail TimeMusEd@ti-me.org ; http://www.ti-me.org/

Music Technology in the Classroom

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May 2005

Historical Development of Music Technology

In the history of music, technology has always been present in aiding the facilitation of composition and publishing. Composers have always used whatever technological means to get their works performed and published, from paper products to ink pens.

Home entertainment using player pianos, public entertainment using circus player organs, and early wax cylinder recordings of Brahms and other piano virtuosos of the turn of the nineteenth century again demonstrate how technology evolves and is used in music and for musicians into the twentieth century.

Historical Highlights of Technology

- Walt Disney's wonderful and creative use of film to give music a visual component was exemplified in the release of *Fantasia* (1940). Here is an example of a more eccentric use of film in music education [entertainment] using an animated film to teach musical texture.
- Television, on the other hand, is a direct education medium for the music classroom. Such a proliferate technology, as evidenced in our homes and classrooms, television was used as an educational tool in the 1950's.
- In general music education classrooms, the record player used in the 1960's and 70's by the music educator to demonstrate songs to the class has been replaced by the CD boombox since the 1990's.

Historical Highlights

- The available and affordable video camera, along with the proliferation of video production companies, helped to provide clients like music educators with educational projects for the classroom and products for the music educator marketplace.
- Computers are our present tools of instruction and creation in the music education classroom as a music technology.
- The different veins of music software development such as digital audio recording, digital sequencing, digital video, CD, DVD production, music notation, and music publishing have converged to form comprehensive technological systems.

Historical Highlights

- MIDI (Musical Instrument Digital Interface) is basically a set of computer rules of communication that allow various computer-related devices to communicate with one another. MIDI was developed during the early 1980's with the goal of giving products the ability to be used interchangeably.
- Using this technology in educational settings resulted in the MIDI workstation consisting of keyboard, MIDI interface for connectivity, and hardware sequencer or computer.
- Presently, a MIDI lab consists of computers connected to MIDI – enabled keyboards that students can use to compose, transcribe, arrange music, ear training, notation, and to explore music theory.

Change in Instruction

- The change is in the role of student and teacher. The passive recipient of instruction or information as taught by the teacher, becomes the active thinker and choice-maker.
- Technology encourages students to actively think about information, to make choices, and to facilitate skills not used in conventional teacher-led lessons.
- Project – based work such as composing music, creating a commercial, performing or researching, integrate with cooperative learning approaches illustrate the change in student and teacher roles.
- The teacher becomes a facilitator, a coach in which the student is allowed more thinking room and encouraged to be creative and embrace possibilities.

Effects on Learning

- Applying music technology in the music classroom requires a different approach to the music student of elementary, secondary, and high schools levels.
- Increased student interest and achievement are the merits of integrating music technology into the curriculum.
- A diversified and varied approach designed as age appropriate works well for students in each level.
- Age appropriate music software programs offer aural-visual music games of music note identification and note series retention, further strengthening the sound-symbol relationship.
- There is a need to connect technology with the presence of traditional mechanical musical instruments.

Effects on Learning

- Where earlier the instruction and depth of learning reached to the systems of sound-symbol relationships with notes and phrases, now **music**, either in performing or composing, takes on a deeper significance.
- Music technology in the music classroom can only increase understanding of musical concepts, elements of music, and their interaction.
- It can facilitate learning in ways that reinforce traditional concepts of how **music** is perceived, and encourage the development of musical thinking as well as experimentation in areas of teaching and curriculum that traditional methods fall short.

Effects on Learning

- Several effects on learning which technology brings about are increased motivation, self-esteem, improved study habits, reading skills, and math skills.
- Technical skills that the student acquires through the use of a broad range of software increases a basic understanding of how different computer tools operate.
- The music student will use these skills as tools to explore how music is constructed and heard using a variety of music software, and to support their learning of new software applications.
- These paths encourage more collaboration with peers working in cooperative groups as well as peer tutoring.

Effects on Learning

- Technology effects on learning are further enhanced at the middle school and high school levels. The use of technology, in conjunction with the developmental stage these students are at, increases learning possibilities not possible at the elementary level.

Use of Technology in the Classroom

- The broad range of music software and the tools to facilitate use in learning creates a broad range in the perspectives and strategies for use in the music classroom.
- The teaching objectives must align with features and capabilities of technology software programs.
- For primary students who are in the preoperational stage of intelligence of Piaget's theory of cognitive development, technology can help students demonstrate through logical and systematic manipulation of symbols (notes, rests, clefs, and other musical symbols) by relating this to concrete objects (the learning objectives in the program).

Use of Technology in the Classroom

- The use of music software programs can be either for individual or class practice. Individual practice can bring struggling students in line with motivated feelings of improvement and better class efforts.
- The use of sequencers and notational programs to teach multiple components of the music curriculum is applicable to both middle and high school music programs.
- The sequence and notational programs can be used in the classroom for playback of sequences, arranging music, or composing original music.
- Choral instructors can sequence the vocal parts to a difficult selection to learn and rehearse parts by muting vocal parts.

Use of Technology in the Classroom

- Classroom use of computer aided instruction can focus on individual needs.
- Music students gravitate towards creating their own music and notation/sequencer applications can allow opportunities for creativity and exploration.
- Individual work at a computer station on basic music concepts and terminology will help the student improve more efficiently than taking time to reinstruct in the classroom.
- Use software such as ECS's *Music Flash Cards*, which presents important music material in a drill and practice format with evaluation displayed at the end of each session.

Philosophical Viewpoints

- In music education, what role should music technology have in the music classroom today and in the future?
- It should have a supportive role that connects technology to extend curriculum.
- Music technology should and can provide an opening to all students wherever they are at in terms of knowledge, ability, skill, and interest.

Philosophical Viewpoints

- Music technology is a powerful tool for teaching and learning, so the educator must integrate it into the curriculum and be open to redefining the ways of teaching and learning.
- The instructor must make music technology work for the basic concepts of the lesson within the curriculum.

Philosophical Viewpoints

- A brave willingness to familiarize themselves with the features and integrate it into the lesson is part of making the technology serve music classroom teaching and learning.
- As music teaching changes through the future years, so will the tools.
- Find the right balance between traditional methodologies and music technologies.
- Music educators should exploit technology's respective strengths and abilities for the music classroom.

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